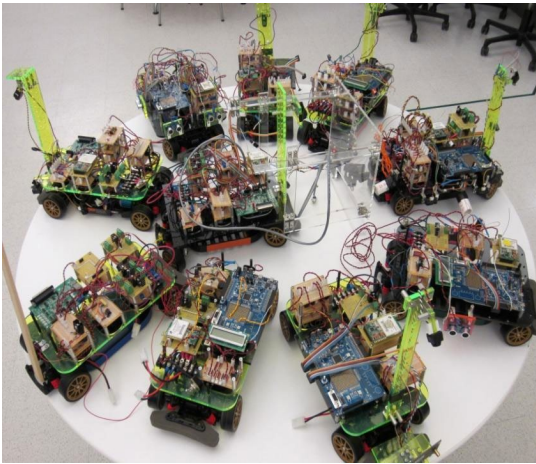




**PRINCETON**

**Electrical and  
Computer  
Engineering**

# Electrical and Computer Engineering Detailed Handbook Academic Year 2023-2024



Communications Network Optical  
Devices Energy Robotics Control  
Information Security Computer Systems  
Software Electronic Computer Aided  
Design Solid State Physics Computer  
Architecture Biomedical Applications

Photonics Computer Design Real-time  
Computing Microelectronics  
Circuits Electronic Optoelectronic  
Materials Computational Signal  
Processing



# Table of Contents

<b>TO PROSPECTIVE MAJORS</b>	<b>2</b>
<b>1. GENERAL INFORMATION</b>	<b>3</b>
1.1 OVERALL STRUCTURE	3
1.2 FACULTY ADVISORS	3
1.3 CERTIFICATE AND SPECIAL PROGRAMS	3
<b>2. UNIVERSITY AND GENERAL B.S.E REQUIREMENTS:</b>	<b>4</b>
2.1 WRITING REQUIREMENT	4
2.2 COURSES	4
2.3 DISTRIBUTION AREA REQUIREMENTS	4
2.4 MATH AND SCIENCE REQUIREMENTS	4
2.5 COMPUTER PROFICIENCY	4
2.6 TRANSFER OF CREDIT	4
<b>3. ECE PROGRAM REQUIREMENTS</b>	<b>4</b>
3.1 FOUNDATION	4
3.2 CORE	5
3.3 MATHEMATICS	5
3.4 BREADTH	5
3.5 ENGINEERING SCIENCE	5
3.6 BALANCE AND COMPLETENESS	5
3.7 DESIGN	5
3.8 CONCENTRATION	6
3.9 INDEPENDENT WORK/SENIOR THESIS	9
3.10 ETHICS AND SOCIAL CONTEXT	9
4.1 TWO GENERIC EXAMPLE PROGRAMS	9
<b>5. MISCELLANY</b>	<b>10</b>
5.1 ACADEMIC PROGRESS	10
5.2 HONORS	10
5.3 INTERDISCIPLINARY PROGRAMS	10
5.4 INTERNATIONAL STUDY (PLAN AHEAD!) AND SUMMER COURSES AT OTHER INSTITUTIONS	11
5.5 INDEPENDENT RESEARCH FUNDING	11
5.6 THE FUND FOR EXCELLENCE IN ELECTRICAL AND COMPUTER ENGINEERING	11

## TO PROSPECTIVE MAJORS

On behalf of the faculty of the Department of Electrical and Computer Engineering, our warmest welcome. This booklet outlines the academic programs available within the department. We encourage you to follow up your reading of this material through discussions with department faculty and students and exploration of the department's web pages. The most important things you need to know are the distinctive features of our undergraduate program:

- Rigorous training in engineering fundamentals
- Exposure to modern applications and recent research results
- Participation in independent study/research
- Required completion of seven courses from a wide range of elective courses in the liberal arts, with the flexibility to take up to twelve electives from outside engineering

At the same time, our program provides the opportunity to:

- Combine studies in Electrical and Computer Engineering with a wide variety of other fields such as biology, economics, computer science, neuroscience, and physics
- Complete one of Princeton's many Certificate Programs
- Take courses in entrepreneurship and engineering management
- Participate in a junior-year exchange program with Oxford University or spend a semester abroad studying at another institution

A key feature of the program is the opportunity to participate in research, either on a project of your design or a project in a faculty member's research laboratory. Students may enroll in independent research as early as the sophomore year. The Department provides bench space and has a dedicated fund to support students' independent projects. The Department also has funds available to support students attending domestic engineering conferences, whether to present research results or simply to take advantage of valuable professional development opportunities. There is also funding specific to those students whose projects have an innovative and entrepreneurial focus.

Our program has been carefully designed to prepare our graduates to excel in engineering innovation and in life-long learning. The program also offers outstanding preparation for professions in business, finance, government, law, and medicine. Recent graduates have gone on to work in a wide range of fields – a set of representative examples is given on the department website. A significant percentage of our graduates go on to study at the top graduate and professional schools in the country.

In the pages that follow, you will find the ECE Department course requirements and outlines of some typical academic programs pursued by majors. The Department cannot be described with a few facts and figures. It encompasses a vast range of topics and activities reflecting the diverse nature of the field and the varied interests of the students and faculty. I encourage you to visit the department's facilities and to meet with both students and faculty. We are happy to discuss your interests and career plans, to answer questions about our academic programs, and to help you design a course of study that best meets your individual interests.

Prospective ECE majors should see us first for a general discussion about departmental programs and procedures, and for selection of a faculty advisor. After our meeting, your faculty advisor will take responsibility for assisting you with academic decisions and approving your course selections.

David Wentzlaff and Gerard Wysocki, Departmental Representatives  
[wentzlaf@princeton.edu](mailto:wentzlaf@princeton.edu); [gwyssocki@princeton.edu](mailto:gwyssocki@princeton.edu)

# 1. General Information

## 1.1 Overall structure

The Department of Electrical and Computer Engineering offers an undergraduate program of study in Electrical Engineering accredited by the Engineering Accreditation Commission of ABET, <https://www.abet.org>, under the General Criteria and the Program Criteria for Electrical, Computer, Communications, Telecommunication(s) and Similarly Named Engineering Programs. After entering the Department as majors, students embark on a rigorous plan of study to acquire mastery of core knowledge in Electrical and Computer Engineering. The program begins with a set of introductory foundation courses (information, circuits, devices, and digital logic). The intent of these courses is to provide essential knowledge for upper-level elective courses and to expose majors to the breadth of this exciting discipline. This foundation is built upon with two core preparatory and design courses, followed by a set of department electives that support the concentration area of your choice. Possible areas of concentration range from theoretical topics (such as communications and network theory) to more experimental and design topics (such as advanced biomedical circuits). Students tailor their areas of concentration in consultation with their faculty program advisors.

In addition to the concentration, students are required to participate in two semesters of independent research concluded with a Senior Thesis in the senior year. However, many students enroll in additional independent study beyond this minimum requirement.

The program's flexibility allows students to create a tailored program to suit their interests. For example, ECE majors may combine their program with studies in biology, computer science, economics, energy, materials science, management, neuroscience, public policy, physics, or several other fields. Many majors combine their study of Electrical and Computer Engineering with one of the many interdisciplinary certificate programs offered at Princeton.

## 1.2 Faculty Advisors

The ECE Departmental Representative is the faculty advisor for all sophomore and upperclass students in the department. In addition, each student is assigned a faculty program advisor to consult in more detail concerning both academic program matters and career advice. Students see their program advisors each semester to review their progress towards graduation and to have their course selections approved. Subsequent course changes should be discussed with the program advisor, as the advisor's signature is required on any course-change forms submitted to the Registrar. All seniors should also discuss any course changes with the Departmental Representative and also obtain his signature on the course-change forms. The program advisors for the various classes are as follows:

**Class of 2024:** Y. Ghasempour (B322), N. Jha (B220), P. Prucnal (B314), P. Ramadge (B222), A. Rodriguez (B318), J. Thompson (B328)

**Class of 2025:** A. Houck (B424), S. Kulkarni (B310), J. Lee (C328), S. Lyon (B428), S. Malik (B224), H. Tureci (B312), Saien Xie (B422)

**Class of 2026:** S. Chou (B412), J. Fisac (F315), C. Gmachl (B227A), C. Jin (C332), V. Poor (B330), K. Sengupta (B216), N. Verma (B226) P. Viswanath (B308),

## 1.3 Certificate and Special Programs

Various ECE faculty serve as coordinating faculty for special programs offered by the university. Some of these programs offer certificates. If you enroll (or wish to enroll) in any of these programs, you may find it helpful to consult the appropriate faculty in addition to your faculty program advisor for help in planning your curriculum.

<b>Certificate Program:</b>	<b>Coordinating Faculty</b>
Engineering Biology:	Celeste Nelson
Engineering and Management Systems:	Amir Ali Ahmadi
Engineering Physics:	Daniel Marlow
Technology and Society:	Naveen Verma
Materials Science and Engineering:	Alejandro Rodriguez
Entrepreneurship-Keller Center	Naveen Verma
Environmental Studies:	Corina Tarnita
Robotics and Intelligent Systems:	Szymon Rusinkiewicz
Applications of Computing:	Jaswinder Pal Singh

## 2. University and General B.S.E Requirements:

### 2.1 Writing Requirement

A 100-level course in the subject area of WRI.

### 2.2 Courses

Thirty-six courses are required for completion of the B.S.E degree in a 4-year program (or 28 courses for a 3-year program for students granted advanced standing).

### 2.3 Distribution Area Requirements

Minimum of seven courses in the humanities and social sciences. For the class of 2024 and beyond: The humanities and social science courses must include one course in four of the following seven areas: Culture and Difference (CD), Epistemology and Cognition (EC), Ethical Thought and Moral Values (EM), Historical Analysis (HA), Literature and the Arts (LA), Social Analysis (SA), and Foreign Language (at the 107/108 level or above) - [General Education Requirements | Undergraduate Announcement \(princeton.edu\)](#).

### 2.4 Math and Science Requirements

All B.S.E students must complete: MAT 103, MAT 104, (MAT 201 or MAT 203), and (MAT 202 or MAT 204 or equivalent), or alternatively EGR 152 and EGR 154 sequence; (PHY 103 or PHY 105) and (PHY 104 or PHY 106 or equivalent), or alternatively EGR 151 and EGR 153 sequence; CHM 207 or (CHM 201/201A or equivalent). Requirements cannot be taken P/D/F or audit, but may be met by advanced placement.

### 2.5 Computer Proficiency

The computer proficiency requirement can be fulfilled by taking ECE 115 or COS 126. The requirement may not be taken P/D/F or audit.

### 2.6 Transfer of Credit

At most four courses, excluding programs such as study abroad, may be applied to the 36 required courses.

## 3. ECE Program Requirements

### 3.1 Foundation

All ECE majors are required to take:

- ECE 201 **Information and Signals**
- ECE 203 **Electronic Circuit Design, Analysis and Implementation**
- Beginning with the class of 2022, one of
  - ECE 206 **Contemporary Logic Design**
  - ECE 308 **Electronic and Photonic Devices**

This requirement should be satisfied by the end of the sophomore year, although due to course conflicts in related fields (Computer Science, Physics, ...), 206 or 308 may be delayed to the junior year. All of these courses are open to first year students (308 with a strong high school physics background.)

Note that ECE 206 is a prerequisite for many courses in the computer systems area and 308 is a prerequisite for ECE 445, the gateway to further electronic materials and device courses.

### 3.2 “System-Building”

Working in teams, all students must design and build their own “cyberphysical system,” combining hardware and software concepts.

- ECE 302 **Robotic and Autonomous Systems Lab** ("Car Lab")

### 3.3 Upper-Level Mathematics

At least one additional upperclass (300 level or higher) math course. Examples include: MAE305/MAT301, MAE306/MAT302, ORF309\*/MAT309, COS 240 (formerly COS340). This may not count towards the concentration requirement, the breadth requirement or as a Departmental requirement (See 3.6). Additional upperclass math courses may be used for that purpose. (Note: COS 302/ECE 305 - Mathematics for Numerical Computing and Machine Learning cannot be used to satisfy this requirement.)

### 3.4 Breadth

At least one department elective course, 300-level or above, in an area distinct from your area of concentration. The following courses are also possible: ECE 206/COS 306, ECE308\*, COS 318, 320, 333, 402, 426, 429, 432, 441,461; PHY 208/305 – must take both PHY208 and PHY 305 (counts as one). Note: ORF309 cannot be used to satisfy this requirement. Of special note: TigerHub states you need one course each in two areas. One of your concentration courses will serve as one of the two needed. This means you need one course outside of concentration and the other course will naturally fall into your concentration. The departmental representative is the final authority on whether or not a course can fulfill a requirement.

\*ECE206/COS306 and ECE308 may be used for Breadth if not used for Foundation (3.1).

### 3.5 Engineering Science

An engineering course with a significant scientific component must be taken outside of ECE to satisfy this requirement. Many courses can be used to satisfy this requirement; note, however, that a course comprised largely of mathematics or applied mathematics does not satisfy the requirement. The course used to satisfy the Engineering Science requirement cannot also be used to satisfy the concentration requirement or the breadth requirement, nor can it be counted as a Departmental requirement. The following is a non-exhaustive list of possibilities: COS 217, 226, 320, 402, 423, 425, 451, 487; MAE 206, 221, 222, 324, 328, 344, 345, 433, 434; CEE 205, 207, 305, 471; MSE 301, 302; CBE 245, 246, 341, 415, 447; ORF 307, 311, 405, 406, 417.

### 3.6 Balance and Completeness

ECE students must take at least two upperclass technical courses in each of the last four semesters. These 300-level-or-higher courses are called Departmental courses. Of the eight Departmental courses, at least five must be ECE courses and normally include 302 and the senior thesis (497, 498). The remaining three courses can be taken in CEE, CHM, CBE, COS, EEB, ECE, ENE, MAE, MAT, MOL, MSE, ORF or PHY. Courses outside Electrical and Computer Engineering counted towards this requirement must be closely related to the student's academic program.

### 3.7 Design

In the junior year, ECE 302 takes each student through all phases of a design project, emphasizing hands-on experience while providing classroom guidance. In addition, at least one upperclass ECE course with substantial engineering design content must be selected from the following: ECE 373, 375, 404, 457, 458, 462, 475, 481, 482, COS 426, 436. This requirement may also be satisfied with junior or senior independent work, if that work contains *a substantial design component*.

### 3.8 Concentration

Each student must develop depth in a coherent area of concentration in the department by completing three courses in one concentration area. The ten possible concentrations span the core disciplines within ECE as well as important applications areas. While many concentrations are interdisciplinary, two of the three courses must be listed in ECE (crosslisted is OK). ORF 309/MAT 309 may be used to satisfy either the upperclass mathematics requirement or the concentration requirement, but not both.

Graduate courses (500 level) are open to undergraduates after the completion of a permission form containing the signatures of instructor and departmental representative. The permission form is available from the undergraduate coordinator or you can download at <http://registrar.princeton.edu/student-services/>. Graduate courses can be included in a concentration with departmental representative permission.

**P/D/F:**

**All of the courses described in these sections, 3.1-3.8, must be graded. P/D/F courses will not fulfill the requirements.**

## ECE Undergraduate Concentrations: the Details.

All courses must be 300-level or higher.

For all concentrations, at least two courses must be ECE (or ECE cross-listed) courses.

12/7/23

### Circuits and Systems

Required:

**ECE 304 Electronic Circuits: Devices to ICs (S)**

Two courses from:

- ECE 445 Solid-State Electronic Devices (F)
- COS/ECE375 Computer Architecture and Organization (F)
- ECE 368 Intro to Wireless Communication Systems (S)**
- ECE373/ENE373 Power Electronics and Smart Grids (not offered Spring '24)
- ECE 382 Probabilistic Systems and Information Processing (not offered Spring '24)
- ECE 462 Design of VLSI (S)**
- ECE 464 Embedded Computing (not offered Spring '24)
- ECE 472 Architecture for Secure Computers/Smartphones
- ECE 475 Computer Architecture (S)**
- ECE 481 Power Electronics (F)
- ECE 482 Digital Signal Processing (F)

### Data and Information

**ORF 309\* Probability and Stochastic Systems (F & S)** is required.

Then two or three courses from the list.\*

- ECE 346 Intelligent Robotic Systems (S)**
- ECE 364\*\*\* Machine Learning for Predictive Data Analysis (F)**
- ECE 368 Intro to Wireless Communication Systems (S)**
- ECE 381 Networks: Friends, Money and Bytes (not offered F'23)
- ECE 382 Probabilistic Systems and Information Processing (not offered Spring '24)
- ECE/COS 432 Information Security (S)**
- NEW COURSE ECE433/COS435\*\* Introduction to Reinforcement Learning (S)**
- ECE434/COS434 \*\*Theoretical Machine Learning
- ECE 435\*\* Machine Learning and Pattern Recognition (F)
- ECE 470 Principles of Blockchains (F)
- ECE473/COS473 Elements of Decentralized Finance (S)**
- ECE 482 Digital Signal Processing (F)
- ECE 483 Signal Processing and Optimization in Smart Grids – **ONE-TIME COURSE (S '23)**
- ECE 486 Transmission and Compression of Information
- COS 302/ECE305\*\* Mathematics for Numerical Computing & ML (F)
- COS 324\*\*\*Introduction to Machine Learning (F, S)**
- COS 424\*\* Fundamentals of Machine Learning
- COS 429 Computer Vision (S)**
- ORF 350\*\*\* Analysis of Big Data (S)**
- ORF 363 Computing and Optimization for the Physical And Social Sciences (also COS 323) (S)**

\*ORF 309 can fulfill either the 300-level math requirement, or serve as one of the 3 Data and Information courses, but not both.

-If ORF 309 is taken to fulfill the 300-level math requirement, take 2 ECE courses from this list, plus any other course on this list.

**\*\*2 of these 3 courses can be machine learning but not all three.**

- If ORF 309 is taken as one of the 3 D&I courses (implying another 300-level math course) take any 2 ECE courses from this list.

**\*\*\*Only one of the following machine learning courses may be applied to this concentration since they have overlapping content: ECE364, ORF350 and COS324.**

### Security and Privacy

Required:

**COS/ECE 432 Information Security (S)**

Two courses from:

- COS/ECE 375 Computer Architecture and Organization (F)
  - ECE 364\*\* Machine Learning for Predictive Data Analysis (F)
  - ECE 435\*\* Machine Learning and Pattern Recognition (F)
  - ECE 464 Embedded Computing (not offered Spring '24)
  - ECE 470 Principles of Blockchains (F)
  - ECE 472 Architecture for Secure Computers/Smartphones
  - ECE473/COS473 Elements of Decentralized Finance (S)**
  - COS 324\*\*Introduction to Machine Learning (F, S)**
  - COS 424\*\* Fundamentals of Machine Learning
  - COS 433 Cryptography (S)
  - COS 461 Computer Networks (F)
- \*\* Only one Machine Learning course may be applied towards this concentration

### Electronic Devices and Materials

Required:

ECE 445 Solid-State Electronic Devices (F) - (Pre-req is ECE 308\*\*)

Two courses from:

- ECE 304\* Electronic Circuits: Devices to ICs (S)**
  - ECE 308\*\* Electronic and Photonic Devices (F)
  - ECE373/ENE373\* Power Electronics and Smart Grids (not offered Spring '24)
  - ECE 342 Principles of Quantum Engineering (S)**
  - ECE 431 Solar Energy Conversion (S)
  - ECE 441 Solid-State Physics I (F)
  - ECE 449 Micro-Nanofabrication and Thin-Film Processing (not offered Spring '24)
  - NEW COURSE ECE 451 Bioelectronics and Biosensors (S)**
  - ECE 481\* Power Electronics (F)
  - ECE 557 Solar Cells (not offered F '23)
  - MAE 324 Structure and Properties of Materials (F)
  - MAE 424 Energy Storage Systems
  - MSE 301 Materials Science and Engineering (S)**
  - MSE 302 Laboratory Techniques in Materials Science (F)
  - MSE 505 Characterization of Materials (S)**
- \* Only one circuits (304, 481 or 373) course may be applied towards this concentration
- \*\*ECE308 does not count if taken as part of the Foundation Requirement



## Computer Systems

Required:

COS/ECE 375 Computer Architecture and Organization (F)

Two courses from:

ECE 368 Intro to Wireless Communication Systems (S)

ECE 462 Design of VLSI (S)

ECE 464 Embedded Computing (not offered Spring '24)

ECE 470 Principles of Blockchains (F)

ECE 472 Architecture for Secure Computers/Smartphones

ECE473/COS473 Elements of Decentralized Finance (S)

ECE 475 Computer Architecture (S)

COS 318 Operating Systems (F)

COS 320 Compiling Techniques (S)

COS 461 Computer Networks (F)

## Robotics and Cyber-physical Systems

Three courses from:

ECE 345 Intro to Robotics (F)

ECE 346 Intelligent Robotic Systems (S)

ECE 304 Electronic Circuits: Devices to ICs (S)

COS/ECE 375 Computer Architecture and Organization (F)

ECE 364\*\* Machine Learning for Predictive Data Analysis (F)

ECE373/ENE373 Power Electronics and Smart Grids (not offered Spring '24)

**NEW COURSE** ECE433/COS435\*\* Introduction to Reinforcement Learning (S)

ECE 435\*\* Machine Learning and Pattern Recognition (F)

ECE 464 Embedded Computing (not offered Spring '24)

ECE 481 Power Electronics (F)

COS 324\*\*Introduction to Machine Learning (F, S)

COS 429 Computer Vision (S)

MAE 433 Automatic Control Systems (F)

\*\* Only one Machine Learning course may be used for this concentration

## Quantum Information and Applied Physics

ECE342\*\* Principles of Quantum Engineering (S)

Two courses from:

ECE 396 Introduction to Quantum Computing (F)

ECE 441 Solid-State Physics I (F)

ECE 453 Optical & Quantum Electronics (F)

ECE 456 Quantum Optics (S)

ECE 457 Experimental Methods in Quantum Computing (S)

ECE 568 Implementations of Quantum Information (F)

\*\* PHY208 and 305 can be taken in lieu of ECE 342, but are counted as one course for the concentration requirement

## Biomedical Engineering

Three courses from:

ECE 304 Electronic Circuits: Devices to ICs (S)

**NEW COURSE** ECE 451 Bioelectronics and Biosensors (S)

ECE 452 Biomedical Imaging (S)

ECE 480 fMRI Decoding: Reading Minds

COS 429 Computer Vision (S)

COS 455/QCB455 Genomics & Computational Molecular Biology (F)

MAE 344 Biomechanics and Biomaterials (S)

NEU 427 Systems Neuroscience (F)

**NEU 437 Systems Neuroscience: Computing with Populations of Neurons (S)**

## Optics and Photonics

Required:

ECE 351 Foundations of Modern Optics (F)

Two courses from:

ECE 342 Principles of Quantum Engineering (S)

ECE 431 Solar Energy Conversion (S)

ECE 452 Biomedical Imaging (S)

ECE 453 Optical & Quantum Electronics (F)

ECE 455 Optical and Photonics Systems for Environmental Sensing (S)

ECE 456 Quantum Optics (S)

ECE 458 Photonics and Light Wave Communications (F)

MAE 521 Optics and Lasers

## Energy and the Environment

Three courses from:

ECE 373/ENE 373 Power Electronics and Smart Grids (not offered Spring '24)

ECE 445 Solid-State Electronic Devices (F)

ECE 431 Solar Energy Conversion (S)

ECE 455 Optical and Photonics Systems for Environmental Sensing (S)

ECE 481 Power Electronics (F)

ECE 483 Signal Processing and Optimization in Smart Grids – **ONE-TIME COURSE** (S '23)

ECE 557 Solar Cells: Physics, Materials, and Technology

MAE 424 Energy Storage Systems

ECE concentration courses offered in Spring '24 are highlighted in yellow.

### 3.9 Independent Work

Independent projects or research projects outside of normal structured lecture or laboratory courses are a valuable educational experience. Such projects are extremely challenging on both a personal and academic level, but are also extremely fulfilling. Requirements include both written documents and an oral presentation. Independent work cannot be used to fulfill the breadth or concentration requirements.

A Senior Thesis is required. You must have both an advisor and a second reader. The department does not require a bound copy of the thesis. You will be required to submit a pdf of your thesis on the Senior Thesis due date determined by the ECE Department.

### 3.10 Ethics and Social Context

Successful engineering innovation is fostered by core technical excellence, exposure to the latest developments in the discipline, *and an appreciation of the economic, ethical, societal, and cultural context within which engineering operates*. The department encourages majors to draw from the liberal arts programs for grounding in the social context vital to solving the technological challenges of the future. By doing so, Electrical and Computer Engineering graduates will find their education to be a strong foundation for professional responsibility and career development. Electrical and computer engineers generally adhere to the IEEE Code of Ethics: <http://www.ieee.org/about/corporate/governance/p7-8.html>.

## 4. Generic ECE Study Program and Specific Sample

### 4.1 Two Generic Example Programs

Two sample programs of study are given below. "Departmental Elective" and "Technical Elective" are technical courses, normally either Electrical and Computer Engineering, Computer Science, Mathematics, Physics, other engineering courses, or courses that form part of a coherent pattern of study for students emphasizing special programs in areas such as engineering and management systems, engineering physics, or engineering biology. Courses labeled "Elective" are free-choice elective courses selected from department or other technical courses, entrepreneurship courses or humanities/social science courses.

Generic Example 1: No Advanced Placement in Math/Physics/Chemistry	
<b>Freshman Year</b>	
Math 103: Calculus PHY 103: Mechanics Chem 207: Materials Chemistry Elective: writing requirement	Math 104: Calculus PHY 104: Elect. & Magnetism COS 126: Computer Science Elective: humanities/social science Elective: humanities/social science
<b>Sophomore Year</b>	
Math 203: Multivariable Calculus ECE 206: Contemporary Logic Design <b>or</b> ECE 308: Electronic and Photonic Devices Engineering Science Elective: humanities/social science	Math 204: Linear Algebra ECE 201: Information and Signals ECE 203: Electronic Circuit Design, Analysis and Implementation Elective Elective: humanities/social science
<b>Junior Year</b>	
2 Departmental Electives Upper Level Math Elective Elective Elective: humanities/social science	ECE 302: Building Real Systems Departmental Elective Technical Elective Elective: humanities/social science
<b>Senior Year</b>	
Departmental Elective ECE 497 Senior Thesis Elective: humanities/social science Elective	Departmental Elective ECE 498 Senior Thesis Elective Elective

Generic Example 2: One Course Advanced Placement in Math	
<b>Freshman Year</b>	
Math 104: Calculus PHY 103/EGR151: Mechanics Chem 207: Materials Chemistry Elective: writing requirement	Math 203: Multivariable Calculus PHY 104/EGR153: Elect. & Magnetism COS 126: Computer Science Elective: humanities/social science Elective: humanities/social science
<b>Sophomore Year</b>	
Math 204: Linear Algebra ECE 206: Contemporary Logic Design <b>or</b> ECE308: Electronic and Photonic Devices Engineering Science Elective: humanities/social science	ECE 201: Information and Signals ECE 203: Electronic Circuit Design, Analysis and Implementation Upper Level Math Elective Elective Elective: humanities/social science
<b>Junior Year</b>	
2 Departmental Electives Technical Elective Elective Elective: humanities/social science	ECE 302: Building Real Systems Departmental Elective Technical Elective Elective: humanities/social science
<b>Senior Year</b>	
Departmental Elective ECE 497: Senior Thesis Elective: humanities/social science Elective:	Departmental Elective ECE 498: Senior Thesis Elective Elective

## 5. Miscellany

### 5.1 Academic Progress

The B.S.E degree in Electrical and Computer Engineering requires a minimum performance level. Students are expected to maintain a C average in their Sophomore ECE program courses as well as in the Departmental courses in the Junior and Senior years. Should a student drop below a C average, the department will recommend an appropriate action to the University Faculty Committee on Examinations and Standing. The resulting action will be the issuing of an Academic Warning or the requirement of withdrawal from the University.

### 5.2 Honors

The "Departmental Standing," which determines eligibility for graduation and the eligibility for the awarding of graduation Honors, is based on the average grade of the eight of the Departmental courses with the best grades. At least a C average is required for graduation and a B+ average is required to be eligible for consideration for Honors. The awarding of Honors, High Honors, and Highest Honors is determined by a vote of the faculty based on performance in all technical courses. Typically, independent project and thesis work are also given special consideration when awarding Honors.

### 5.3 Interdisciplinary Programs

Interested students may combine their work in ECE with coursework in other departments through interdisciplinary Certificate Programs such as Engineering and Management Systems, Engineering Physics, Materials Science and Engineering, Engineering Biology, Environmental Studies and Applied and Computational Math. Students fulfilling a Certificate Program will receive a special certificate upon graduation. Majors should consult with their advisors to develop an ECE program that best combines their ECE interest with the interdisciplinary program. Additional material on a Certificate Program may be obtained by contacting the Director of the Program (listed in the Undergraduate Announcement).

## **5.4 International Study and Summer Courses at Other Institutions (Plan Ahead!)**

The world is a big place, with many different approaches to life (and college). Living and studying outside the US can enhance one's education in multiple ways. Considering the ECE program requirements, a semester outside the US can best be achieved in the fall of the junior year, and in special cases with proper senior thesis planning, in the fall of the senior year. Because of the importance of ECE 302, study abroad in spring of the junior year is generally not a viable option. (The "junior year at Oxford program" does have a suitable 302 substitute, and is encouraged for Princeton ECE majors.)

Princeton allows up to four courses at other institutions (summer study, semester abroad ...) to be transferred to your Princeton transcript. While they are transferred without a grade, they may be used to fulfill general university and SEAS math/physics/chemistry (Section 2 of this handbook) in accordance with Dean of the College and SEAS policies, respectively, but not the SEAS computing requirement. Summer courses may not be used for any of the ECE requirements in Section 3 of this handbook, except for 300 level math (Sect. 3.3).

Courses from fall and spring semesters at institutions outside the US may be counted towards all ECE requirements in Section 3 of this handbook, generally up to two per semester, with the exception of ECE 302 (excepting Oxford as noted above). This includes the eight Departmental courses, although without a grade international studies courses are omitted from the Departmental-based GPA calculations (Sect. 5.2)

Any intent to transfer courses from outside Princeton to meet any of the SEAS or ECE requirements must be approved by SEAS or ECE before you take the courses. Plan ahead.

## **5.5 Independent Research Funding**

The Electrical and Computer Engineering Department, the School of Engineering and Applied Science and the Dean of the College's office offer funding opportunities for independent projects requiring financial support for acquisition of data or other special requirements. Funding requests require the submission of a detailed proposal and budget. Details are available in the Undergraduate Office.

## **5.6 The Fund for Excellence in Electrical and Computer Engineering**

Funds from this endowed gift to the department are available to support students attending an engineering conference held in the USA or Canada. Students must submit a detailed request for funding well in advance of registering or traveling to the conference. Details are available in the Undergraduate Office.